

Patent Claims:

1. A measuring device for determining the flow rate of a mass flow particularly for measuring a bulk material flow, including an impeller wheel (2) supported by a drive shaft (3) for driving said impeller wheel with a constant rpm, said mass flow being admitted to said impeller wheel, which deflects the mass flow thereby imposing a radial and a tangential velocity component on the mass flow, whereby the drive shaft (3) comprises a drive spur wheel (11) meshing with an intermediate spur wheel (21) which is driven by a drive spur wheel (20, 31), and a force measuring device (26) holding the intermediate spur wheel in place, and that the drive shaft (3) is coaxially surrounded by a support sleeve (4) which reaches all the way into a housing space (1) of the impeller wheel (2), characterized in that the support sleeve (4) is driven by separate drive means (19, 32) whereby these separate drive means (19, 32) drive the support sleeve (4) with an rpm which corresponds to the rpm of the drive shaft (3), and wherein said support sleeve (4) is rotatably mounted in a stationary housing section (5).

2. The measuring device of claim 1, characterized in that said support sleeve (4) is constructed as a tube that coaxially surrounds the drive shaft (3) and serves for rotatably supporting (12, 34, 35) and guiding the drive shaft (3).

1     **3.**     The measuring device of claim 1 or 2, characterized in that  
2     the support sleeve (4) is rotatably mounted in the  
3     stationary housing section (5) by a two point bearing (14),  
4     and that sealing means (15) are provided at least relative  
5     to the housing space (1) of the impeller wheel (2), said  
6     sealing means (15) preventing penetration by mass particles  
7     particularly bulk material dust.

1     **4.**     The measuring device of one of the preceding claims,  
2     characterized in that the support sleeve (4) is connected  
3     to a driving mechanism (13) which is driven by said  
4     separate drive means (19, 32) with a constant rpm.

1     **5.**     The measuring device of one of the preceding claims,  
2     characterized in that the support sleeve (4) and the drive  
3     shaft (3) are driven by two separate drive means (19, 21,  
4     32) and by a common drive (16, 30), wherein the drive means  
5     of the drive shaft (3) is an intermediate spur wheel (21)  
6     and the separate drive means are an upper intermediate spur  
7     wheel (32), an upper drive spur wheel (19), a chain or gear  
8     belt drive.

1     **6.**     The measuring device of one of the preceding claims,  
2     characterized in that the intermediate spur wheel (21)  
3     connected to the drive shaft (3), is rotatably mounted on  
4     a force transmitting arm (24) that is radially deflectable  
5     and which supports itself on a force measuring device (26).

1 7. The measuring device of one of the preceding claims,  
2 characterized in that either a slide bearing (12), or a  
3 bearing of spring elements (34, 35), or an elastomer  
4 bearing is provided as a rotatable bearing of the drive  
5 shaft (3) in the support sleeve (4), whereby the spring  
6 elements (34, 35) or the elastomers are soft against  
7 bending in the direction of rotation and stiff against  
8 bending in the radial and axial directions.

1 8. The measuring device of one of the preceding claims,  
2 characterized in that the drive shaft (3) is closed to the  
3 housing space (1) of the impeller wheel (2) relative to the  
4 support sleeve (4), by at least one rubber bellows seal or  
5 labyrinth seal (33).

1 9. The measuring device of one of the preceding claims,  
2 characterized in that the force transmitting arm (24) is  
3 rotatably mounted about its pivot point (27) by a low  
4 friction slide bearing, or a ball bearing (25) or a spring  
5 element bearing.

1 10. The measuring device of one of the preceding claims,  
2 characterized in that the spring element bearing comprises  
3 at least three vertically arranged leaf spring elements  
4 (34, 35) which are connected in a horizontal plane (36, 37)  
5 either with the drive shaft (3) or with the support sleeve  
6 (4).

1     **11.** The measuring device of one of the preceding claims,  
2         characterized in that the mounting of the drive shaft (3)  
3         is provided by at least two axially spaced spring element  
4         bearings (34, 35) whereby one of said bearings (35) is  
5         provided between the drive spur wheel (14) and the support  
6         sleeve spur wheel (13).